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THE SPLACHNUMS.

ELIZABETH G. BRITTON.

The taller specimens of *Splachnum luteum*, illustrated in the plate accompanying this number, were collected by Mr. M. W. Gorman at White River, Yukon Territory, near the Alaska Boundary. The specimens are remarkable not only for their large size, which exceeds any measurements recorded, but also for the fact that very few of the capsules had developed the characteristic apophysis or "yellow umbrellas" which are shown in the smaller specimens. But it was these "umbrellas" that attracted Mr. Gorman's attention, for he says, "I noticed a moss in open spots on the borders of Sphagnum marshes, that I had not observed in Oregon, Washington or southern Alaska. The tall delicate stems had many of their tips surrounded by a pale yellow cap about five-sixteenths inches wide, causing the moss to be noticeable amongst the surrounding grasses, sedges and ericaceous plants. I would like an explanation of the yellow caps, some of which may still be seen on the specimen, although it has been twice immersed in the icy waters of the White River."

Their absence may be due to immersion in cold water, but it is evident that although they were collected on August 14th, they had not fully developed and grew taller from being among shrubs and grasses. It generally happens with most mosses that grow in crowded tufts, that some of the plants do not get their share of nourishment and room, and hence do not attain the size and development that others do. This may be seen in *Funaria hygrometrica* particularly. In endeavoring to learn something about the anomalous specimens of *Splachnum*, the researches made by J. R. Vaizey on this species, published in the Annals of Botany for 1890, will be of interest. In this paper he states that being convinced of the importance of obtaining further knowledge of the highest development to which the sporophyte of the mosses attains, as being likely to throw light indirectly on the phylogeny of the higher Cryptogams and Phanerogams, he determined to investigate the morphology of *Splachnum luteum* and *S. rubrum*. These species being arctic or subarctic, and not found in Great Britain, he made a journey to Norway for his material. He did not succeed in getting much of the Red Umbrella Moss, but of the yellow he secured abundant specimens. He says of these:

"In the sporophyte of *S. luteum* we have a structure with a remarkable similarity to an umbrella, the handle end, which is inserted in the tissues of the oophyte, is known as the foot. The seta is much elongated, frequently attaining the length of 150 meters (6 inches); it bears the umbrella-like expansion, the apophysis, at the top just below the sporangium. It is the structure of the apophysis which is of greatest interest." Mr. Vaizey found

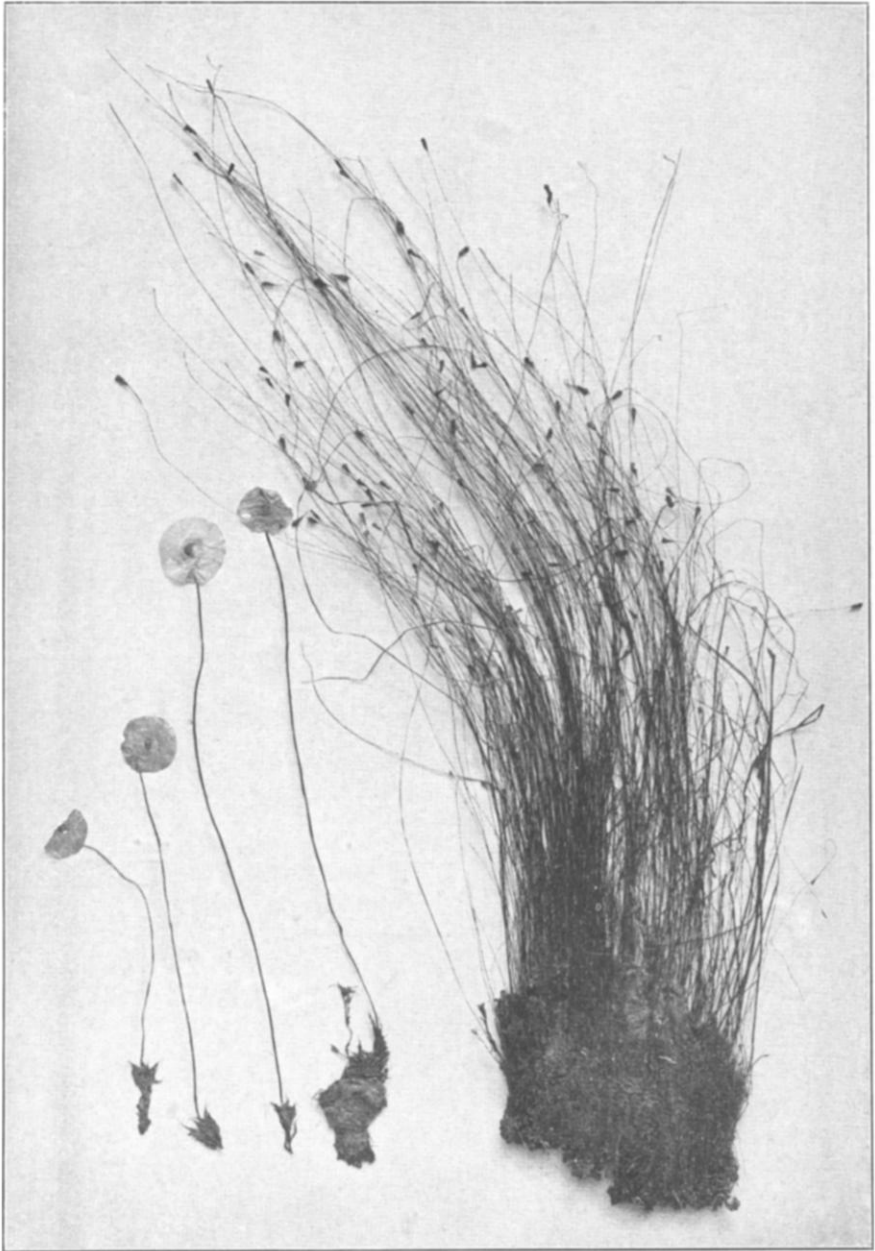


PLATE XI. *Splachnum luteum*.

that the tissues of the oophyte surrounding the foot, contained a quantity of organic substance, and that large numbers of leucoplastids were developed which served to absorb nourishment for the sporophyte. Sections through the foot, seta and capsule, showed that the water and organic substances were conveyed through the central tissue of the seta to the apophysis. These cells contain little or no chlorophyll, but outside of them in the expanded portions of the apophysis the cells are rich in chlorophyll, and on the upper side of the "umbrellas" have even formed a "palisade-tissue" similar to that developed in leaves of vascular plants. Furthermore there are a number of stomata developed on the upper surface around the top of the umbrella. It is evident then that the apophysis or umbrella, performs the functions of a leaf, and is therefore analogous to the leaves of vascular plants. That is, it is an organ of respiration and assimilation and large quantities of starch are formed in it, especially while the apophysis is still young and green at the beginning of the formation of the umbrella and before the spores ripen.

Unfortunately Mr. Vaizey died before his studies were completed so that gaps remain in the life-history of this most highly developed and specialized moss, but it is evident that even without developing the umbrella the capsules are able to mature their spores. The article is illustrated by a series of plates which are most interesting.

The history of the *Splachnums* is equally interesting. The first reference to them occurs in a small vellum-covered volume, published in London in 1695, called "Petiver's Museum, containing the first century of Rare Natural Objects of Animals, Fossils and Plants." He described *Splachnum rubrum* as "Muscus Norvegicus umbraculo ruberrimo insignito. We owe the discovery of this elegant plant to my friend Mr. Richard Wheeler, who gathered it near Portsground, in Norway, and for its singularity and likeness I think it may not very improperly be called his Norway Bongrace Moss. This quaint little volume is filled with pictures of various curious natural objects sent to Pettiver for his museum. Both Ray and Dillenius had descriptions and plates of *S. rubrum*, specimens of which had also been sent from the Lena River. But Linnaeus was the first to give them the names which they now bear. In a series of essays written by his pupils in 1752, one is devoted entirely to three species of *Splachnum*, *S. luteum*, *S. rubrum* and *S. ampullaceum*. *S. luteum* was called the "Swedish Parasol Moss." Linnaeus took up the names in his Species Plantarum. The apophysis in *S. rubrum* is the same shape and size as in *S. luteum*, but in *S. ampullaceum* it is shaped like an urn, and is much larger than the spore-case.

None of the species of this family are common in North America. *Splachnum luteum* has been collected in New Brunswick by Fowler, and *S. rubrum* was collected on the shores of a small pond in the Adirondacks by Prof. Peck. One curious peculiarity of them all, is that they grow on the excrement of animals, on cow and horse dung, and on the decomposing skeletons of animals, such as mice, hedgehogs, etc. *Tetraplodon mnioides* has

been found on the summits of Mt. Marcy, Mt. Mansfield and on Mt. Washington, along the bridle-path, and on the timbers of the stable. There is one species only, which is found in the Southern States. In Europe they used to be common in Alpine pastures, but are growing rare, owing to the drying up and draining of the marshes. It is strange that they are able to maintain such a sporadic and scattered existence, when their food-supply is so uncertain and peculiar.

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ON SOME FOSSIL MOSSES.

BY JOHN M. HOLZINGER.

Fossil mosses are rare. It is, therefore, with pleasure that I report on some from Iowa. In 1897 Prof. T. H. MacBride took from a railroad cut near Oelwein, Iowa, several wads of moss embedded in blue clay at a depth of 32 feet below the surface of the ground, beneath the Kansas Drift. This material was intrusted to Prof. P. C. Myers, at present science teacher in the Winona High School, for the purpose of ascertaining the presence of diatoms in the clay matrix, and it is from Mr. Myers that I have received this material for examination.

So far as I can ascertain, the age of the deposit under which this moss is found is estimated to be between 5,000 and 10,000 years. Small wonder, therefore, that the stems have become rather brittle. However, it is possible, as I have found by careful manipulation, to float out some stems which show the characteristic branching and leaf position of certain *Harpidia*, notably of *Hyphnum fluitans*, and my conclusion after considerable work on this fragmentary moss, the leaf areolation of which is admirably preserved, is that it is certainly one of the *Harpidia* and comes nearest to *Hyphnum fluitans brachydictyon* Ren. The preservation of this moss for so long a period is a matter of surprise. Two causes seemed to have conspired. First, it is a well known fact that peat bogs formed by the annual addition of vegetable matter furnished to the subaqueous stratum, have by this process antiseptic properties imparted to the water tending to preserve certain organic forms, and the aquatic habit of this *Harpidium*, together with the blue clay surrounding it (the color of blue clay being due to the presence of carbonaceous matter from bogs), point to this antiseptic bog water as a preservative. Secondly, the matrix, the blue clay, seems to have formed an effective mechanical protection, hermetically sealing it under tons of its substance against the access of air. This second element of protection alone could not have effected the preservation, and the first mentioned element, the antiseptic property of carbonaceous mud in bogs, has probably been the principal factor.

In this connection it is proper to call attention to an article in the *Botanisches Centralblatt*, 1901, Bd. X, Heft 3, on "A Fossil Moss from the Vicinity of Fulda," Germany. (Ueber ein Fossiles Laubmoos aus der Umgebung von Fulda,) by Mr. Adelbert Geheeb. The author, supported by Dr. K. Schliephacke, determined this moss as *Hyphnum fluitans fossile*. *Amblystegium*